

## PERFORMANCE OF INTREPID 80WSP UNDER SECTION 18 EXEMPTION IN MID-SOUTH COTTON

L. C. Walton, J. W. McGee and J. A. Spivey  
Rohm and Haas Company  
Philadelphia, PA

### Abstract

Section 18 Emergency Exemptions were granted for Intrepid 80WSP (methoxyfenozide, RH-2485) insecticide in June of 2000 for control of the beet armyworm (*Spodoptera exigua*) on cotton (*Gossypium* spp.) in Arkansas, Louisiana, Mississippi and Texas. These exemptions allowed Rohm and Haas Company to conduct large scale aerial and ground experiments with Intrepid 80WSP insecticide in cotton for control of the beet armyworm. In addition, data was also obtained with Intrepid 80WSP insecticide for control of the soybean looper (*Pseudoplusia includens*), fall armyworm (*Spodoptera frugiperda*) and saltmarsh caterpillar (*Estigmene acrea*). Data from three aerial experiments indicate that Intrepid 80WSP insecticide was highly effective with cessation of feeding occurring rapidly and mortality occurring in 2 to 7 days. Number of live worms and feeding damage was reduced with Intrepid 80WSP applied at a rate range of 1.0 to 3.0 ounces/acre in 5 gallons of water per acre by aerial application. Residual effectiveness of Intrepid 80WSP was apparent for at least 14 days for beet armyworm, soybean looper and saltmarsh caterpillar.

### Introduction

Intrepid is a novel "MAC" (Molting Accelerating Compound) insecticide from Rohm and Haas Company which provides effective control of a broad range of lepidopterous insects. Intrepid, which is highly selective for Lepidoptera, is safe to other orders of arthropods including important beneficial predators, parasitoids insects and honeybees, thereby making it an excellent choice for integrated pest management. As a MAC insecticide, Intrepid mimics on the natural insect molting hormone, 20 hydroxyecdysone. It induces a premature lethal molt of the larvae within hours of ingestion of treated plant tissues.

On June 5<sup>th</sup>, 2000, the EPA granted a Section 18 Emergency Exemption from Registration for Intrepid insecticide for the control of beet armyworm in cotton grown in Arkansas, Louisiana, Mississippi and Texas.

Rohm and Haas Company personnel conducted large scale aerial and ground experiments in cotton with Intrepid 80WSP for control of the beet armyworm. Data was also collected on effectiveness of Intrepid for control of other Lepidoptera pests which included soybean looper, fall armyworm and saltmarsh caterpillar.

This manuscript will discuss results from 3 aerial experiments conducted in Mississippi in 2000. Field experiments ranged in size from 24 to 32 acres and spray gallonage was 5 gallons per acre.

The objectives of these experiments were (1) To determine the minimum effective use rate for control of fall armyworms, soybean looper, beet armyworm and saltmarsh caterpillar with Intrepid 80WSP applied in large plot demonstrations and (2) To work closely with independent crop consultants and university/extension personnel to determine the "fit" for Intrepid 80WSP for foliage and boll feeding insect control in cotton.

Experiment locations included Midnight, Mississippi with Intrepid 80WSP applied at 1.0 and 2.0 ounces/product/acre, Louise, Mississippi with Intrepid 80WSP applied at 1.0, 2.0 and 3.0 ounces/product/acre, and Indianola, Mississippi with Intrepid 80WSP applied at 1.0, 2.0 and 3.0

ounces/acre. At all locations, Latron CS-7 applied at 0.25% v/v was tank-mixed with Intrepid 80WSP.

Evaluation parameters for beet armyworm, saltmarsh caterpillar and soybean looper included recording the number of live and dead larvae per 6 foot of row in the plot at approximately 0, 3, 7 and 14 days after treatment application and averaging the data. Counts were taken with a drop cloth utilizing 6 foot of row with 8 separate locations. Feeding damage was recorded as percent defoliation and rated on a scale of 0 to 100 where 0 = no defoliation and 100 = complete defoliation. Approximately 10 row feet of cotton was tagged and percent defoliation recorded at approximately 0, 3, 7 and 14 days after treatment application with 8 locations recorded per treatment.

Evaluation parameters for fall armyworm included recording percent infestation and percent boll damage. Percent infestation ratings were made by closely examining 25 plants per treatment, counting the number of live larvae and converting to percent infestation. Percent boll damage was rated on a scale of 0 to 100, where 0 = no boll damage and 100 = all bolls damaged. Some bollworms were present when 0 DAA (days after application) and 3 DAA counts were made and some boll damage was attributed to bollworms; however, very minimal amount of boll damage was detected at either 0 DAA or 3 DAA. Percent boll damage was determined by counting the number of damaged and undamaged bolls on 25 plants per treatment.

### Results and Discussion

Table 1 represents number of live larvae taken at Midnight, Mississippi with Intrepid 80WSP applied at 1.0 and 2.0 ounces/product/acre. The commercial standard was Confirm 2F applied at 8 fluid ounces/acre. Latron CS-7 was used at 0.25% v/v with both insecticides. The results from this experiment revealed that both Confirm and Intrepid were highly effective for beet armyworm control with excellent knockdown at 2 DAA, complete control at 5 DAA and excellent residual at 12 DAA. Intrepid 80WSP residual was still apparent at 23 days after treatment at both the 1.0 and 2.0 ounce/acre rates.

Table 2 represents percent defoliation and reveals that with both Confirm and Intrepid, percent defoliation did not change in the 23 day period because beet armyworms stopped feeding after ingestion.

Table 3 illustrates that Intrepid controls both large and small larvae and that treated larvae do not molt or advance stages. At 0 DAA, number of live soybean looper averaged approximately 30 per 6 foot of row per treatment. Efficacy data from this experiment revealed that Intrepid 80WSP applied at 1.0 ounce/acre was all that was required for excellent soybean looper control in cotton. Excellent knockdown was noted at only 4 days after treatment. Please note that the soybean looper population was continuing to increase in the untreated control at the 7 day rating interval while decreasing with all rates of Intrepid.

Table 4 illustrates that the majority of soybean loopers population in the untreated was greater than a 0.5 inch (large) in length, while almost impossible to find in the Intrepid plots regardless of rate at the 7 day interval. This trend continued at the 14 day rating interval.

Table 5 represents # of live saltmarsh caterpillar larvae at same site where soybean looper data was collected. As evidenced, saltmarsh caterpillars were extremely sensitive to the 1.0 ounce/acre rate of Intrepid 80WSP. Equally important is Table 6 where the number of dead saltmarsh caterpillars were detected at 14 days after treatment application, indicating excellent residual activity from Intrepid 80WSP.

Table 7 represents percent defoliation at this location. Percent defoliation was rated at a uniform 10% across the field the day that treatments were initiated. Due to the heavy infestation from soybean looper and saltmarsh caterpillar, the percent defoliation in the untreated increased from 10 to 40 percent in only 7 days and from 40 to 60 percent at the 14 day rating interval. With all rates of Intrepid, percent defoliation did not change from 0 day and was still at 10 percent at 14 DAA. Feeding was shut down completely with the 1.0 ounce/acre rate.

Table 8 represents percent fall armyworm infestation with Intrepid 80WSP at 1.0, 2.0 and 3.0 ounces/acre compared to a commercial standard of 8.0 ounces/acre of Orthene 90 tank-mixed with 1.8 fluid ounces of Karate Z. Precounts at 0 DAA for fall armyworms revealed that the population was at 29.3% infestation with larvae ranging in size from 2nd to 5th instar. Most worms were found feeding in white and pink blooms at this time. Three day ratings revealed that another hatch out had occurred following application and the fall armyworm population in the untreated had increased to 52% infestation. Several of the worms found were 1st and 2nd instars grazing around the bracts on larger bolls. Most of the larger worms (3rd - 5th instar) detected were still in white and pink blooms. Data from the 3 day rating revealed that Intrepid 80W at rates of 1.0, 2.0 and 3.0 ounces/product/acre did not get the fall armyworms out of the white or pink flowers; however, the grower's commercial standard did not get the larger fall armyworms out of the white or pink flowers either. The worms found feeding in the white blooms did not appear to have ingested Intrepid. With Intrepid, regardless of rate, the percent infestation was reduced by approximately 50% compared to the untreated control. Dead fall armyworms were found in the Intrepid plots; however, most were either 1st or 2nd instar. It was apparent that worms had ingested Intrepid based upon the symptoms. Results from 7 and 11 days after treatment were similar and revealed that fall armyworms in cotton with Intrepid are more difficult to control when compared to a more sensitive pests such as beet armyworm. The data does reveal that fall armyworms can be effectively controlled with Intrepid with the rate increased to 3.0 ounces per acre; however, with Intrepid applied at either 1 or 2.0 ounces/product/acre was as effective as the commercial standard.

Table 9 represents percent boll damage and revealed that boll damage with Intrepid at 3.0 ounces/product/acre rate did not increase over the 11 day period. With Intrepid at either the 1.0 or 2.0 ounce/acre rates, as well as the commercial standard, a slight increase in % boll damage was apparent. This same scenario was evident in the untreated control.

### Conclusions

The results of the aerial experiments from 2000 were quite successful with Intrepid. Conclusions from these experiments are: (1) Intrepid applied at a use rate of 1.0 ounce/product/acre was highly effective in reducing beet armyworm, saltmarsh caterpillar and soybean looper population at 2 to 3 days after application. Feeding by these pests was shut down completely. A rate response with Intrepid was not apparent, (2) Length of residual with Intrepid 80WSP at 1.0 ounce/acre for control of beet armyworms, saltmarsh caterpillars and soybean loopers was apparent for at least 14 days after application and (3) Fall armyworms were effectively controlled with Intrepid 80WSP at a rate of 3.0 ounce/acre; however, the 1.0 or 2.0 ounce/acre rate was as effective as the grower's commercial standard.

On July 5<sup>th</sup>, 2000, Rohm and Haas Company received federal registration from EPA on Intrepid for use in cotton. Commercial sales will begin in 2001.

### Control of Beet Armyworm on Cotton with Intrepid 80WSP and Confirm 2F in Aerial Demonstration

Midnight, Mississippi

Cotton Cultivar: Suregrow 747 (non Bt)

Table 1. Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Number of Live Beet Armyworm Larvae per 6 Feet of Row				
		0 DAA	2 DAA	5 DAA	12 DAA	23 DAA
Intrepid 80 wsp	1.0	15.8	7.0	.1	0.0	1.5
Intrepid 80 wsp	2.0	15.8	4.0	.6	0.0	1.0
Confirm 2F	8.0	15.8	6.7	.3	0.1	5.4

<sup>1</sup> Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all treatments at 0.25% v/v.

### Control of Beet Armyworm on Cotton with Intrepid 80WSP and Confirm 2F in Aerial Demonstration

Midnight, Mississippi

Cotton Cultivar: Suregrow 747 (non Bt)

Table 2. Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Percent Defoliation <sup>(2)</sup>				
		0 DAA	2 DAA	5 DAA	12 DAA	23 DAA
Intrepid 80 wsp	1.0	5.8	3.2	2.0	2.0	1.6
Intrepid 80 wsp	2.0	5.2	4.6	2.5	1.8	1.0
Confirm 2F	8.0 fl oz	2.0	3.3	3.3	1.6	2.4

<sup>1</sup> Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all treatments at 0.25% v/v.

<sup>2</sup> Percent defoliation is from a scale of 0 to 100 where 0 = no defoliation and 100 = complete defoliation.

### Control of Soybean Loopers on Bt. Cotton with Intrepid 80WSP in Aerial Demonstration:

Indianola, MS

Cotton Cultivar: DPL 422 Bt. RR

Table 3. Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Number of Live Soybean Loopers per 6 Foot of Row			
		0 DAA	4 DAA	7 DAA	14 DAA
Intrepid 80 wsp	1.0	30.6	8.8	4.1	0
Intrepid 80 wsp	2.0	28.5	9.5	2.9	0
Intrepid 80 wsp	3.0	32.0	3.5	1.6	0
Untreated	0.0	31.2	30.0	35.2	11.5

<sup>1</sup> Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

### Control of Soybean Loopers on Bt. Cotton with Intrepid 80WSP in Aerial Demonstration:

Indianola, MS

Cotton Cultivar: DPL 422 Bt. RR

Table 4. Treatment <sup>(1)</sup>	Rate/ Oz/Acre	No. of Live Soybean Loopers per 6 Foot of Row Separated by Size <sup>(2)</sup>		
		4 DAA SB Looper Larvae by Size	7 DAA SB Looper Larvae by Size	14 DAA SB Looper Larvae by Size
Intrepid 80 wsp	1.0	S=2.5, M=3.0, L=3.3	S=2.9, M=1.1, L=0.1	S=0, M=0, L=0
Intrepid 80 wsp	2.0	S=4.5, M=2.1, L=2.9	S=1.8, M=1.1, L=0.0	S=0, M=0, L=0
Intrepid 80 wsp	3.0	S=1.0, M=1.1, L=1.4	S=0.3, M=1.0, L=0.3	S=0, M=0, L=0
Untreated	0.0	S=3.3, M=8.9, L=17.8	S=1.6, M=6.1, L=27.5	S=0.1, M=0.6, L=10.8

<sup>1</sup> Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

<sup>2</sup> S.B. Looper larvae separated by size: S = Small where five larvae of 0 to 1/8 inch in length, M = Medium where larvae are 1/8 to 1/4 inch in length and L = Large where larvae are greater than 1/4 inch long.

### Control of Saltmarsh Caterpillars on Bt Cotton with Intrepid 80WSP in Aerial Demonstration:

Indianola, Mississippi

Cotton Cultivar: DPL 422 Bt RR

Table 5. Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Number of Live Saltmarsh Caterpillars per 6 Foot of Row <sup>(2)</sup>		
		4 DAA	7 DAA	14 DAA
Intrepid 80 wsp	1.0	0.10	0.0	0.0
Intrepid 80 wsp	2.0	0.10	0.0	0.0
Intrepid 80 wsp	3.0	0.10	0.0	0.0
Untreated	0.0	5.60	4.60	6.5

<sup>1</sup> Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

<sup>2</sup> Number of live and dead saltmarsh caterpillars was determined by counting the number of live and dead salt marsh caterpillars per 6 foot of row at 8 separate locations in the plot and averaging the data.

**Control of Saltmarsh Caterpillars on Bt Cotton with Intrepid 80WSP in Aerial Demonstration:**

**Indianola, Mississippi**

**Cotton Cultivar: DPL 422 Bt RR**

<b>Table 6.</b> Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Number of Dead Saltmarsh Caterpillars per 6 Foot of Row <sup>(2)</sup>		
		4 DAA	7 DAA	14 DAA
Intrepid 80 wsp	1.0	1.80	0.13	2.1
Intrepid 80 wsp	2.0	2.30	0.0	0.80
Intrepid 80 wsp	3.0	2.00	0.13	0.0
Untreated	0.0	0.0	0.0	0.0

1 Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2 Number of live and dead saltmarsh caterpillars was determined by counting the number of live and dead salt marsh caterpillars per 6 foot of row at 8 separate locations in the plot and averaging the data.

**Control of Soybean Loopers/Saltmarsh Caterpillars on Bt. Cotton with Intrepid 80WSP in Aerial Demonstration:**

**Indianola, MS**

**Cotton Cultivar: DPL 422 Bt. RR**

<b>Table 7.</b> Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Percent Defoliation <sup>(2)</sup>			
		0 DAA	4 DAA	7 DAA	14 DAA
Intrepid 80 wsp	1.0	10	10	10	10
Intrepid 80 wsp	2.0	10	10	10	10
Intrepid 80 wsp	3.0	10	10	10	10
Untreated	0.0	10	20	40	60

1 Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2 Percent defoliation is from a scale of 0 to 100 where 0 = no defoliation and 100 = complete defoliation.

**Control of Fall Armyworms on Bt Cotton with Intrepid 80WSP in Aerial Demonstration:**

**Louise, Mississippi**

**Cotton Cultivar: DPL 20B**

<b>Table 8.</b> Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Percent Infestation <sup>(2)</sup>			
		0 DAA	3 DAA	7 DAA	11 DAA
Intrepid 80 wsp	1.0	29.3	24.0	33.3	24.0
Intrepid 80 wsp	2.0	29.3	24.0	36.6	20.0
Intrepid 80 wsp	3.0	29.3	28.0	10.0	12.0
Orthene 90S + Karate Z + Crop Oil	8.0 + 1.8 fl oz + 1 pint/acre	29.3	44.0	30.0	20.0
Untreated	0.0	29.3	52.0	46.6	44.0

1 Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2 % Infestation at 0 DAA for fall armyworms counts were made by closely examining a total of 75 plants in three sections of the field.

**Control of Fall Armyworms on Bt Cotton with Intrepid 80WSP in Aerial Demonstration:**

**Louise, Mississippi**

**Cotton Cultivar: DPL 20B**

<b>Table 9.</b> Treatment <sup>(1)</sup>	Rate/ Oz/Acre	Percent Boll Damage <sup>(2)</sup>			
		0 DAA	3 DAA	7 DAA	11 DAA
Intrepid 80 wsp	1.0	2.0	2.4	4.4	4.9
Intrepid 80 wsp	2.0	2.0	2.3	4.8	4.7
Intrepid 80 wsp	3.0	2.0	2.1	2.1	1.0
Orthene 90S + Karate Z + Crop Oil	8.0 + 1.8 fl oz + 1 pint/acre	2.0	5.6	3.4	6.0
Untreated	0.0	2.0	1.8	6.5	7.8

1 Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2 % Boll damage rated on as scale of 0 to 100 where 0 = no boll damage and 100 = all bolls damaged.